

What is claimed is:

1           1. A semiconductor laser device comprising:  
2           a plurality of laser light oscillators that each emit  
3           a laser beam from an outlet thereof; and  
4           an optical element that at least partially reflects,  
5           scatters, or transmits a laser beam that is oscillated in  
6           at least one of the laser light oscillators and is emitted  
7           from an outlet thereof, so that a portion of the laser beam  
8           is incident on at least one of the other laser light oscillators.

1           2. The semiconductor laser device according to Claim  
2           1,  
3           wherein the plurality of laser light oscillators are  
4           included in a semiconductor laser array element, and  
5           the optical element is disposed so as to face the outlet  
6           of the at least one of the laser light oscillators, the optical  
7           element being a translucent member that (a) partially  
8           transmits the laser beam and (b) partially reflects or scatters  
9           the laser beam so that a portion of the laser beam is directed  
10          to the at least one of the other laser light oscillators.

1           3. The semiconductor laser device according to Claim  
2           1,  
3           wherein the plurality of laser light oscillators are  
4           included in a plurality of semiconductor laser array elements

5 in such a manner that at least two laser light oscillators  
6 are included in each laser light oscillator in an array, the  
7 plurality of semiconductor laser array elements being stacked  
8 up, and

9 the optical element is disposed so as to face the outlet  
10 of the at least one of the laser light oscillators included  
11 in one of the semiconductor laser array elements, the optical  
12 element being a translucent member that (a) partially  
13 transmits the laser beam and (b) partially reflects or scatters  
14 the laser beam so that a portion of the laser beam is directed  
15 to the at least one of the other laser light oscillators included  
16 in the other semiconductor laser array elements.

1 4. The semiconductor laser device according to Claim  
2 1,

3 wherein a reflecting optical path, a scattering optical  
4 path, and a transmitting optical path of the optical element  
5 are directed to the outlet of the at least one of the other  
6 laser light oscillators, thereby the portion of the laser  
7 beam is directed in a vicinity of an optical axis of the laser  
8 beam at the outlet of the at least one of the other laser  
9 light oscillators.

1 5. The semiconductor laser device according to Claim  
2 2,

3 wherein the optical element is a flat plate having a  
4 main surface that is either a flat plane or a scabrous plane,  
5 the main surface being an incidence plane of the laser beam,  
6 and the optical element partially reflects or scatters the  
7 laser beam on the main surface.

1 6. The semiconductor laser device according to Claim  
2 3,

3 wherein the optical element is a flat plate having a  
4 main surface that is either a flat plane or a scabrous plane,  
5 the main surface being an incidence plane of the laser beam,  
6 and the optical element partially reflects or scatters the  
7 laser beam on the main surface.

1 7. The semiconductor laser device according to Claim  
2 2,

3 wherein the optical element is a flat plate which includes  
4 a diffraction grating on a main surface thereof, the main  
5 surface being an incidence plane of the laser beam, and the  
6 optical element partially diffracts the laser beam on the  
7 diffraction grating at a predetermined angle when the optical  
8 element partially reflects the laser beam.

1 8. The semiconductor laser device according to Claim  
2 3,

wherein the optical element is a flat plate which includes a diffraction grating on a main surface thereof, the main surface being an incidence plane of the laser beam, and the optical element partially diffracts the laser beam on the diffraction grating at a predetermined angle when the optical element partially reflects the laser beam.

9. The semiconductor laser device according to Claim 7,

wherein the optical element directs -1st order diffracted light and +1st order diffracted light generated when the laser beam is partially diffracted, so as to be respectively incident on laser light oscillators that are adjacent to the at least one of the laser light oscillators from which the laser beam has been emitted.

10. The semiconductor laser device according to Claim 8,

wherein the optical element directs -1st order diffracted light and +1st order diffracted light generated when the laser beam is partially diffracted, so as to be respectively incident on laser light oscillators that are adjacent to the at least one of the laser light oscillators from which the laser beam has been emitted.

1 11. The semiconductor laser device according to Claim  
2 2,  
3 wherein the optical element has been subjected to  
4 hologram processing so as to function as a hologram to condense  
5 or collimate a portion of the laser beam that has transmitted  
6 therethrough.

1 12. The semiconductor laser device according to Claim  
2 3,  
3 wherein the optical element has been subjected to  
4 hologram processing so as to function as a hologram to condense  
5 or collimate a portion of the laser beam that has transmitted  
6 therethrough.

1 13. The semiconductor laser device according to Claim  
2 2,  
3 wherein the plurality of laser light oscillators each  
4 have two outlets, from one of which the laser beam is emitted  
5 to be reflected, scattered, or diffracted by the optical  
6 element, and from the other of which the laser beam is emitted  
7 from the semiconductor laser array element,  
8 the optical element is disposed so as to face the one  
9 outlet of each of the laser light oscillators, and reflects,  
10 scatters, or diffracts the laser beam.

1 14. The semiconductor laser device according to Claim

2 3,

3 wherein the plurality of laser light oscillators each  
4 have two outlets, from one of which the laser beam is emitted  
5 to be reflected, scattered, or diffracted by the optical  
6 element, and from the other of which the laser beam is emitted  
7 from the semiconductor laser array element,

8 the optical element is disposed so as to face the one  
9 outlet of each of the laser light oscillators, and reflects,  
10 scatters, or diffracts the laser beam.

1 15. The semiconductor laser device according to Claim

2 3,

3 wherein the plurality of semiconductor laser array  
4 elements respectively include substrate layers that have been  
5 cut out of one semiconductor wafer.

1 16. The semiconductor laser device according to Claim

2 2,

3 wherein the plurality of semiconductor laser array  
4 elements each have a real refractive index guided self-aligned  
5 structure.

1 17. The semiconductor laser device according to Claim

2 3,

3 wherein the plurality of semiconductor laser array  
4 elements each have a real refractive index guided self-aligned  
5 structure.

1 18. A multiple wavelength laser light emitting apparatus,  
2 comprising:

3 a plurality of semiconductor laser devices that each  
4 emits a plurality of laser beams, wavelengths of the laser  
5 beams emitted from each semiconductor laser device being  
6 different from wavelengths of the laser beams emitted from  
7 a different semiconductor laser device; and

8 an optical element that condenses a plurality of laser  
9 beams emitted from each of the plurality of semiconductor  
10 laser devices at a predetermined position,

11 wherein at least one of the semiconductor laser devices  
12 is the semiconductor laser device described in Claim 1.

1 19. The multiple wavelength laser light emitting  
2 apparatus according to Claim 18, further comprising:

3 an adjusting means for adjusting a position at which  
4 the plurality of laser beams emitted from each of the plurality  
5 of semiconductor laser devices are condensed, by driving the  
6 optical element;

7 a laser driving means for selecting a semiconductor laser  
8 device that emits laser beams each having a designated

9 wavelength, out of the plurality of semiconductor laser  
10 devices, and driving the selected semiconductor laser device;  
11 and  
12 a control means for controlling the adjusting means in  
13 accordance with a wavelength of the laser beams to be emitted.

1 20. A laser welding apparatus that performs welding using  
2 a laser beam emitted by the multiple wavelength laser light  
3 emitting apparatus described in Claim 19.

1 21. A two-dimensional matrix data forming apparatus that  
2 forms two-dimensional matrix data on a plane of a member,  
3 by irradiating the plane of the member with a laser beam emitted  
4 by the multiple wavelength laser light emitting apparatus  
5 described in Claim 19.

1 22. A semiconductor laser device scalpel apparatus that  
2 is used for an incision or hemostasis of a living body, by  
3 irradiating the living body with a laser beam emitted by the  
4 multiple wavelength laser light emitting apparatus described  
5 in Claim 19.

1 23. A tumor treating apparatus that performs treatment  
2 of a malignant tumor, by irradiating a living body into which  
3 photofrin has been injected with a laser beam emitted by the



4 multiple wavelength laser light emitting apparatus described  
5 in Claim 19.

1 24. A hair restoration apparatus that performs hair  
2 restoration, by irradiating a head with a laser beam emitted  
3 by the multiple wavelength laser light emitting apparatus  
4 described in Claim 19.

1 25. A retinal detachment treatment apparatus that  
2 performs treatment of retinal detachment, by irradiating a  
3 retina with a laser beam emitted by the multiple wavelength  
4 laser light emitting apparatus described in Claim 19.

1 26. A myopia treatment apparatus that performs treatment  
2 of myopia, by irradiating a cornea with a laser beam emitted  
3 by the multiple wavelength laser light emitting apparatus  
4 described in Claim 19.

1 27. A cutting or punching apparatus that performs a  
2 cutting or punching process on a member, by irradiating the  
3 member with a laser beam emitted by the multiple wavelength  
4 laser light emitting apparatus described in Claim 19.

1 28. A surface transformation treatment apparatus that  
2 performs a surface transformation treatment on a member, by

3 irradiating the member with a laser beam emitted by the multiple  
4 wavelength laser light emitting apparatus described in Claim  
5 19.